

# CONTROLLER IN A BANDING PACKING MACHINE

## BACKGROUND OF THE INVENTION

### 1. FIELD OF THE INVENTION

5           The present invention relates to a banding packing machine and more particularly to a controller in a banding packing machine which controls to carry out cutting, welding and the like for binding a band in a predetermined timing.

### 10   2. DESCRIPTION OF THE PRIOR ART

          In an automatic or semi-automatic banding packing machine, a band led from a band reel is wound upon an object to be packed and is then clamped, and subsequently, is returned to the band feeding side and is tightened.

15       Then, a bound portion is melted by a heater almost simultaneously with the cutting and is then bonded by means of a press. These operations are carried out continuously and instantaneously in one cycle.

          In such a bonding packing machine, a control portion  
20       utilizing a cam is provided to precisely carry out the operations. The control portion controls a timing. More specifically, a plurality of cams are provided in one cam shaft of the control portion. When the cams are rotated with the cam shaft, cam followers corresponding to the cams

are moved vertically so that a plurality of members carry out a predetermined operation. Thus, clamping, return, tightening and the like are performed.

In the case in which a large number of operations are to be thus carried out continuously in a short time, a band is gripped insufficiently and the band cannot be returned sufficiently if positions are shifted during the operation of the cam and the cam follower or during the operation of a roller and a touch roller.

When an operation failure occurs in any of these operations in a conventional banding packing machine, it is necessary to stop all driving operations at once and then the cam shaft must be manually rotated to perform banding. That is, the cam shaft should be rotated to an original position, a reverse rotation start position, a tightening start position, a normal rotation start position and the like on the cam shaft, in order to determine whether or not related members are set in a normal position.

However, there has been a problem in that it is necessary to take a great deal of time and labor for a working of manually rotating the cam shaft at each time and carrying out slight regulation to obtain an accurate positional relationship. Furthermore, it is hard to decide whether or not a stop position reached after the manual

rotation is a normal position.

#### SUMMARY OF THE INVENTION

In consideration of the circumstances, it is an object of the present invention to provide a controller in a banding packing machine which can slightly regulate an operation distance through an operation to be utilized for slightly regulating an operation distance by a link operation and can easily set a correct condition when the controller in the banding packing machine for clamping, returning and tightening a band has a timing shifted from a predetermined timing.

In order to attain the object, the present invention provides a controller in a banding packing machine, comprising:

a cam shaft to be rotated upon receipt of force from a driving source;

a plurality of cams provided in the cam shaft;

a timing plate provided in the cam shaft and having a hole formed corresponding to a predetermined position such that a rotation position of the cam shaft can be detected; and

detecting means for detecting that the hole formed on the timing plate reaches the predetermined position,

wherein an inching mode is provided in which the

rotation of the cam shaft is stopped when the detecting means detects the predetermined hole of the timing plate.

With such a structure according to the present invention, it is possible to ascertain whether or not a related member is placed in a predetermined position by setting an inching mode when the hole formed on the timing plate reaches a predetermined position. In the case in which it is confirmed that the related member does not have a predetermined positional relationship, it is preferable that a power source should be once turned off to regulate the position.

It is preferable that an inching mode for stopping the rotation of the cam shaft when the detecting means detects the predetermined hole of the timing plate, and an operation mode for causing the detecting means to detect the hole of the timing plate, thereby driving the cam shaft in a normal cycle should be switchable.

If the inching mode and the operation mode can be thus switched, the inching mode is set before a first operation is carried out and it is ascertained whether or not the inching mode is set in a normal condition. If the inching mode is set in the normal condition, the operation mode may be exactly set to carry out a continuous operation. On the other hand, if it is decided that the

positional relationship is not accurate, it is preferable that regulation should be precisely carried out again and the operation mode should be then set.

As described above, according to the controller in the banding packing machine in accordance with the present invention, it is possible to decide, at each time, whether or not the positional relationship of each member is set in a correct condition in a state in which the inching mode is set.

Accordingly, it is possible to easily adjust the positional relationship between the members.

These objects as well as other objects, features and advantages of the present invention will become more apparent to those skilled in the art from the following description with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view showing a control portion in a banding packing machine according to an embodiment of the present invention,

Fig. 2 is a front view showing a state in which the control portion according to the embodiment is assembled,

Fig. 3 is a perspective view showing a timing plate fixed to a cam shaft, and

Fig. 4 is a sectional view showing an operation for

carrying out banding by means of the control portion according to the present embodiment.

#### DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the present invention will be described below with reference to the drawings.

Fig. 1 shows a control portion in a banding packing machine for carrying out an operation for clamping, welding and cutting a tip portion of a band.

In the control portion, a right presser member 2, a left presser member 4 and a middle presser member 6 which are vertically moved by the operation of a cam mechanism are accommodated in a support block 8, and the support block 8 is supported between a pair of fixed plates 12 and 14 through a screw member 10 or the like.

On the other hand, as shown in Fig. 2 a cam shaft 22 is rotatably supported on shaft insertion holes 11 and 13 formed on the fixed plates 12 and 14. The cam shaft 22 is rotated upon receipt of the force of a driving source such as a motor which is not shown. Cam followers 16, 18 and 20 are attached to the lower parts of the right presser member 2, the left presser member 4 and the middle presser member 6 respectively. In addition, these cam followers 16 abut on the peripheral surfaces of cams 24, 26 and 28 provided in the cam shaft 22. The cam followers 16, 18 and 20 are

pulled toward the cam side with spring 30 so that they are maintained in the abutment state on the cams. A timing plate 45 is fixed integrally with the cam shaft 22.

The state of the cams 24, 26 and 28 and members to be operated based on cams in a series of motions thereof can be confirmed by the timing plate 45, when the cams 24, 26 and 28 supported on the cam shaft 22 are rotated. For example, three holes 42, 44 and 46 are formed apart from each other at a predetermined interval as shown in Fig. 3.

For example, the detection of the holes 42, 44 and 46 implies that of the start of each step. If the rotation of the cam shaft 22 is caused to stand by when the hole is detected, it is possible to identify the positional relationship between the members for the start of a next step.

Accordingly, if the cam shaft 22 is placed in an original position when the hole 42 is detected, for example, it is possible to ascertain whether or not the right presser member 2, the left presser member 4 and the middle presser member 6 are set in correct conditions at the original position.

Accordingly, if the position is correct at that time, a signal for the original position can be output in a correct timing.

As shown in Fig. 4, the band B is inserted into a guide hole 48 of the right presser member 2 by the driving force of a band feeding roller 50. When the tip of the band B is passed through the band arch 51 and abuts on a stopper (not shown) by the driving force of the band feeding roller 50, the right presser member 2 is lifted to interpose the band B between the non-slip portion 49 and the slide table 34.

Thereafter, the band feeding means 50 is reversed in directions of arrows in Fig. 4 to pull the band B. Consequently, the band B is forcibly removed from a band guide arch 51 and is wound onto an object W to be packed. When the band B is wound onto the object W to be packed, band B is further pulled and tightened. After the band B is thus tightened, the left presser member 4 is moved to an uppermost position to interpose the binding rear end side of the band B between the non-slip portion 3 of the left presser member 3 and the slide table 34. In this state, the binding tip portion of the band B and the binding rear end portion are opposed to each other with a space maintained vertically. A heater 36 is inserted in the space, thereby melting the surface of the band B. When the surface of the band B is molten, the middle presser member 6 is lifted to push the molten portion thereagainst and is



bonded thereto. At this time, the cutting blade 40 of the middle presser member 6 cuts the band B together with the right presser member 2.

Thus, a series of banding works are carried out. If a heater 36 shown in Fig. 4 is to protrude from the side when the hole 44 is detected, it is necessary to carry out regulation again if the heater 36 is not a protruded position when the hole 44 is detected. In the present embodiment, an inching mode is set so that the rotation of the cam shaft 22 is stopped when detecting means 50 detects the hole 44. Therefore, it is possible to easily ascertain whether or not the heater 36 has protruded correctly.

In the banding packing machine, usually, when a power source is turned on, a normal operation is carried out to clamp, return and tighten a band and to pressure weld the band through the heater, in that order. Therefore, even if the heater 36 has not protruded in the original position, the cam shaft 22 passes by the same position and is rotated differently from the present embodiment. In the present embodiment, the cam shaft 22 stops rotating once, every time the holes 42, 44 and 46 are detected. Therefore, it is possible to ascertain whether or not each member is placed in a correct position.

In the control portion according to the present embodiment, thus, the inching mode for adjusting the positional relationship between the members is provided. Therefore, it is possible to ascertain whether or not the positional relationship has deviated during the stop.

In the correct condition, moreover, it is preferable that the operation mode should be exactly set to carry out a continuous operation.

Furthermore, if the inching mode and the operation mode can be thus switched, the operation mode can be set immediately to operate the banding packing machine in a correct position. Therefore, a deterioration in productivity can be prevented.

While the embodiment of the present invention has been described above, the present invention is not restricted to the embodiment.

For example, while the number of the holes to be formed on the timing plate is three in the embodiment, any number of holes may be provided. Furthermore, the number of the cams to be provided in the cam shaft 22 is not restricted to three. Furthermore, the switching from the operation mode to the inching mode may be carried out by turning on a power switch while pressing a reset switch. Moreover, the reset switch is not restricted but another

switch may be used. In the inching mode, furthermore, the operation may be stopped in each timing and the reset switch may be pressed to proceed to a next step.

Numerous modifications and alternative embodiments of the present invention will be apparent to those skilled in the art in view of the foregoing description. Accordingly, this description is to be construed as illustrative only, and is provided for the purpose of teaching those skilled in the art the best mode of carrying out the invention.

10 The details of the structure and/or function may be varied substantially without departing from the spirit of the invention and all modifications which come within the scope of the appended claims are reserved.